0.4M Monochrome/Color Vision Sensor (Internal illumination)

VG Series

PRODUCT MANUAL

For your safety, read and follow the considerations written in the instruction manual, other manuals and Autonics website.

The specifications, dimensions, etc. are subject to change without notice for product improvement. Some models may be discontinued without notice.

Features

- Vision sensors with integrated LED lighting
- Global shutter method for accurate image capturing with minimal motion blur
- Enhanced optical performance with light interference prevention technology
- Tight lens cover attachment allows application in environments with dust or shock
- Various inspection functions
- Inspection simulator function
- Set up to 32 separate work group (64 inspection points per work group)
- Save data to FTP servers
- Free vision sensor software included (Vision Master) : inspection simulator function, manage parameters and work group, inspection results monitoring, send data to FTP, multilingual support, etc.
- IP67 protection structure (IEC standard)

Safety Considerations

- Observe all 'Safety Considerations' for safe and proper operation to avoid hazards.
- ⚠ symbol indicates caution due to special circumstances in which hazards may occur.

⚠ Warning Failure to follow instructions may result in serious injury or death.

01. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
    Failure to follow this instruction may result in economic loss, personal injury or fire.
02. **Do not use or store the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
    Failure to follow this instruction may result in fire or explosion.
03. **Do not use this product for protecting human body or part of body.**
04. **Do not see light LED directly or direct beam at person.**
    Failure to follow this instruction may result in damage on eyes.
05. **Do not connect, repair, or inspect the unit while connected to a power source.**
    Failure to follow this instruction may result in fire.
06. **Check connections and connect cables.**
    Failure to follow this instruction may result in fire.
07. **Do not disassemble or modify the unit.**
    Failure to follow this instruction may result in fire.

⚠ Caution Failure to follow instructions may result in injury or product damage.

01. **Use the unit within the rated specifications.**
    Failure to follow this instruction may result in fire or product damage.
02. **Use dry cloth to clean the unit. Do not use water or organic solvent when cleaning the unit.**
    Failure to follow this instruction may result in fire.
03. **Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
    Failure to follow this instruction may result in fire or product damage.

Cautions during Use

- Follow instructions in Cautions during Use. Otherwise, it may cause unexpected accidents.
- Power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- In order to avoid malfunction from static electricity or noise, ground shield wire of the power I/O cable.
- Do not disconnect the power supply while setting operation or saving set information. It may cause data loss.
- Do not disconnect the power supply while updating firmware. It may cause product damage.
- Keep optical section of the sensor away from the contact with water, dust and oil. It may cause malfunction.
- When changing the light or filter, use the assembly tool and observe installation instruction.
- When the sensor is not used for a long time, separate the power cable to store.
- When connecting network, connection must be operated by technical expert.
- In the following case, disconnect the power supply immediately. It may cause fire or product damage.
  - When water or foreign substance is detected in the product
  - When the product is dropped or case is damaged
  - When smoke or smell is detected from the product
- Do not use the product in the place where strong magnetic field or electric noise is generated.
- This unit may be used in the following environments.
  - Indoor (in the environment conditions in specifications)
  - Altitude max. 2,000m
  - Pollution degree 2
  - Installation category II

Ordering Information

This is only for reference, the actual product does not support all combinations.
For selecting the specified model, follow the Autonics website.

VG - ❶ ❷ ❸ - ❹ ❺

❶ Image element
M: Mono CMOS
C: Color CMOS

❷ Resolution
04: 0.4 MP (752 × 480 pixel)

❸ Color of light
W: White
R: Red
G: Green
B: Blue

❹ Effective focal length
Number: Effective focal length (unit: mm)

❺ Communication
E: Ethernet (TCP/IP)

Product Components

- Product (+ built-in light)
- Instruction manual
- Bracket A (BK-VG-A) × 1
- Mounting screw × 2
- Assembly tool (ASST-VG) × 1

Sold Separately

- Bracket B (BK-VG-B)
- Ethernet connector protection cover (P96-M12-1)
- Light (LR-□-06-VG), Color filter (FL-□-VG), Polarizing filter (FL-□-VG)
- M12 connector cable (C□D-□-VG, C□D12-□)
- M12 connector communication cable (C□R-□-VG, C□M8-□PR, C□8-□PR)

Software

Download the installation file and the manuals from the Autonics website.

■ Vision Master

Vision Master is the vision sensor program that allows setting of vision sensor parameters and management of monitoring data such as inspection status and status information.

Network Setting

IP address	192.168.0.2
Subnet mask	255.255.255.0
Gateway	192.168.0.1

- Configure the network settings of vision sensor via Vision Master.
- For initial IP address, refer to the table.

Order of Installation

For more information, refer to the Vision Master software manual.

01. Install the vision sensor.
Refer to the Cautions for Installation and the Working Distance and FOV by Effective Focal Length.

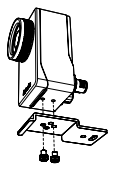
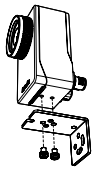
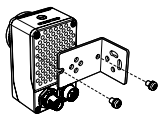
02. Install the vision sensor program, Vision Master, to PC.

03. Connect the vision sensor and the PC, and set the network.
Refer to the Network Setting.

04. Adjust vision sensor focus.
To adjust focus, run Vision Master and activate the 'Focusing Guide' function in the camera setting menu, or use the focus adjuster.

Cautions for Installation

- Install the unit correctly with the usage environment, location, and the designated specifications. For more information, refer to the manual.
- According to the installation direction, necessary bracket type and fixing method are different.

Horizontally from bottom	Vertically from bottom	Vertically from back side
Bracket A	Bracket B	
		

- Check Working Distance and FOV by Effective Focal Length.
- Place the sensing target at the center of the vision sensor lens.
- Using (-) screwdriver, turn focus adjuster to right and left to adjust the focus. (allowable adjusting torque: ≤ 0.343 N m)
  At the focusing guide function of Vision Master, adjust the focus.

Connections

■ Power I/O connector cable (M12 12-pin connector, Plug - Male)

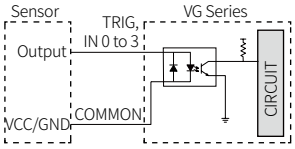
Pin	Cable color C□D-□-VG	Cable color C□D12-□	Signal	Function		
1	Brown	Brown	24VDC⎓			
2	Blue	Blue	GND			
3	White	White	TRIG	Trigger input		
4	Green	Green	IN0	Work group change Bit 0	Work group change Clock	Alarm cleared
5	Pink	Orange	IN1	Work group change Bit 1	Work group change Data	
6	Yellow	Yellow	IN2	Work group change Bit 2	Encoder - Up counter - Quadrature A	
8	Gray	Gray	IN3	Work group change Bit 3	Encoder - Down counter - Quadrature B	
11	Gray/Pink	Sky	COMMON			
7	Black	Black	OUT0	Inspection completion, inspection result, external light trigger, alarm, camera busy, changing work group completed		
9	Red	Red	OUT1			
10	Purple	Purple	OUT2			
12	Red/Blue	Bright green	OUT3			

■ Ethernet connector cable (M12 8-pin-RJ45 connector, Socket - Female)

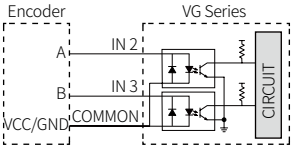
M12 8-pin		RJ45	
Pin	Signal	Pin	Signal
6	RX+	1	TX+
4	RX-	2	TX-
5	TX+	3	RX+
8	TX-	6	RX-
1	-	5	-
7		4	
2		7	
3		8	

Inner Circuit

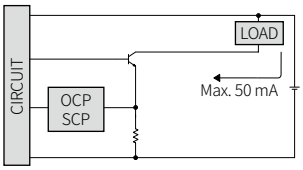
■ External trigger (TRIG) Work group change, Alarm cleared (IN0 to IN3) input



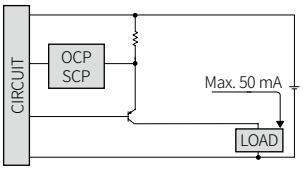
■ Encoder (IN2, IN3) input



■ NPN open collector output

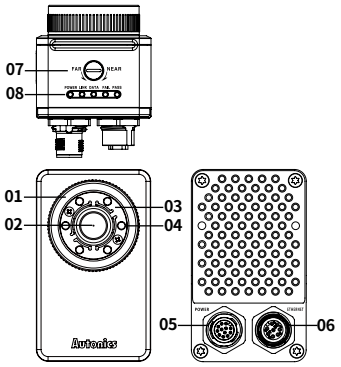


■ PNP open collector output



- OCP (over current protection), SCP (short circuit protection)
- If short-circuit the control output terminal or supply current over the rated specification, normal control signal is not output due to the output short over current protection circuit.

Parts Descriptions



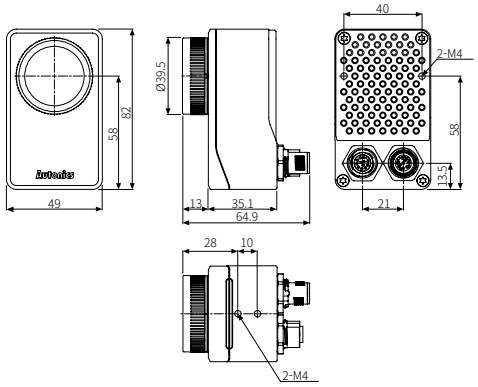
01. Lens cover
02. Lens
03. Light cover
04. LED light
05. Power I/O connector
06. Ethernet connector
07. Focus adjuster
08. Indicators

■ Indicators

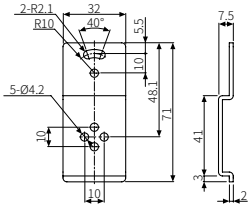
Mark	Color	Name	Function
POWER	Green	Power indicator	Turns ON when power is supplied.
LINK	Green	Ethernet connection indicator	Turns ON in Ethernet communication status.
DATA	Orange	Data transmission indicator	Flashes when data is transmitted from vision sensor to PC.
FAIL	Red	Failure indicator	Flashes when detects failure during work group inspection.
PASS	Green	Pass indicator	Flashes when passed inspection during work group inspection.

Dimensions

• Unit: mm, For the detailed drawings, follow the Autonics website.



■ Bracket A (BK-VG-A)



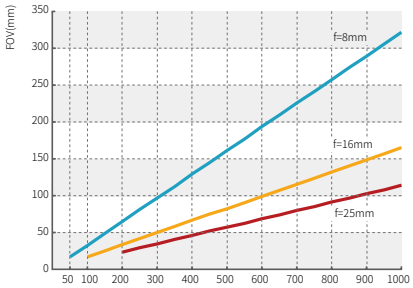
Specifications

Model	VG-M04□-□E			VG-C04□-□E		
Effective focal length	8 mm	16 mm	25 mm	8 mm	16 mm	25 mm
Min. working distance	50 mm	100 mm	200 mm	50 mm	100 mm	200 mm
Image filter	Preprocessing, external filter (color filter, polarizing filter)					
Image element	1/3 inch mono CMOS			1/3 inch color CMOS		
Resolution	0.4 MP (752 × 480 pixel)					
Image snap camera frame per second 01)	≤ 60 fps					
Shutter	Global shutter					
Exposure time	20 to 50,000 μs					
Inspection work group	32 (simultaneous inspection: 64)					
Light ON/OFF method	Pulse					
Light color 02)	White / Red / Green / Blue model					
Trigger mode	External - Internal - Free run setting (software)					
Communication	Ethernet (TCP/IP), 100BASE-TX / 10BASE-T					
FTP trans. output	YES					
Certification	CE UK CA RCM EAC					
Unit weight (package)	≈ 273 g (≈ 415 g)	≈ 274 g (≈ 416 g)	≈ 274 g (≈ 416 g)	≈ 273 g (≈ 415 g)	≈ 274 g (≈ 416 g)	≈ 274 g (≈ 416 g)

01) The number of camera frames per second can be different by image setting or inspection item.
02) Available to buy separately and replace.

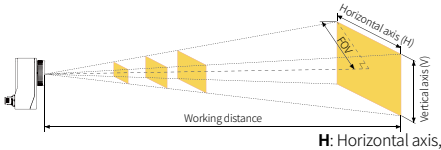
Power supply	24 VDC⎓ ± 10 %
Current consumption	1 A
Rated input signal	24 VDC⎓ ± 10 %
Output signal	NPN-PNP open collector output setting (software)
Load voltage	24 VDC⎓
Load current	≤ 50 mA
Residual voltage	≤ 1.5 VDC⎓
Protection circuit	Output short over current protection circuit, reverse voltage polarity protection circuit
Insulation resistance	≥ 20MΩ (500 VDC⎓ megger)
Dielectric strength	500 VAC~ 50/60 Hz for 1 min.
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	300 m/s² (≈ 30 G) in each X, Y, Z direction for 3 times
Ambient temperature	0 to 45 °C, storage: -20 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection structure	IP67 (IEC standards)
Connection	Connector type
Connector	Power I/O: M12 12-pin, Ethernet: M12 8-pin-RJ45 (cable tightening torque: 0.4 N m)
Material	Case: AL, lens cover: PC, focus adjuster: SUS

Working Distance and FOV by Effective Focal Length



Effective focal length (f)	8 mm	16 mm	25 mm
Min. working distance	50 mm	100 mm	200 mm
Brightness	F2.0	F2.5	F2.5

■ Sensing range by effective focal length (unit: mm)

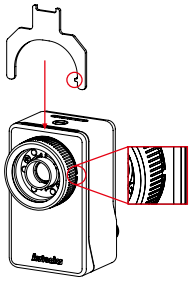


H: Horizontal axis, **V**: Vertical axis

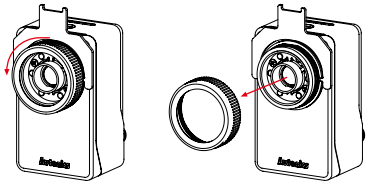
Effective focal length	8 mm			16 mm			25 mm		
Working distance	FOV	H	V	FOV	H	V	FOV	H	V
50	16	27	17	—	—	—	—	—	—
100	32	54	35	16	28	18	—	—	—
200	64	108	69	33	56	35	23	38	25
300	96	163	104	49	83	53	34	58	37
400	129	217	138	66	111	71	46	77	49
500	161	271	173	82	139	89	57	96	61
600	193	325	208	99	167	106	68	115	74
700	255	380	242	155	195	124	80	134	86
800	257	434	277	132	222	142	91	154	98
900	289	488	311	148	250	160	103	173	110
1,000	322	542	346	165	278	177	114	192	123

Replacement of Filter

01. Put and fix the assembly tool into the groove on the side of the vision sensor.



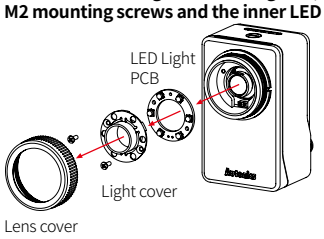
02. While fixing the vision sensor with the assembly tool, hold the lens cover and disassemble it in a counter clock wise direction.



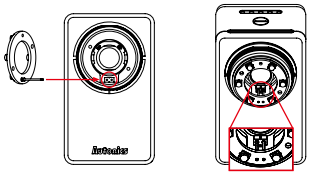
03. Instead of the disassembled lens cover, assemble another filter in clock wise direction.

Replacement of Light

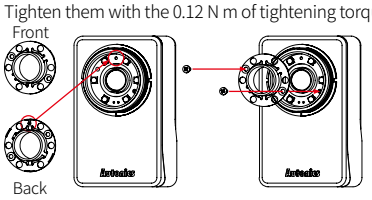
01. Put and fix the assembly tool into the groove on the side of the vision sensor.
02. While fixing the vision sensor with the assembly tool, hold the lens cover and disassemble it in a counter clock wise direction.
03. Disassemble the light cover using the (+) screwdriver, and disassemble the M2 mounting screws and the inner LED light.



04. Place the connection pin of PCB of the inner LED light to face the direction of 6 o'clock and assemble it to the vision sensor body.



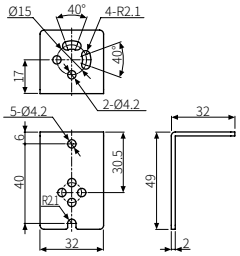
05. Align the light cover with the groove in the direction of 12 o'clock and fix it with the screw.
Tighten them with the 0.12 N m of tightening torque.



06. Assemble the disassembled lens cover in clock wise direction.

Sold Separately: Bracket B (BK-VG-B)

- Unit: mm, For the detailed drawings, follow the Autonics website.



Sold Separately: Ethernet connector protection cover (P96-M12-1)

- Connector protection cover protects unused connectors from foreign substances.
- When installing the connector protection cover, tighten the cover with hand.
- Tightening torque: 0.4 N m

Sold Separately: Light (LR-□-06-VG)

Model	Appearance	Color
LR-W-06-VG		White
LR-R-06-VG		Red
LR-G-06-VG		Green
LR-B-06-VG		Blue

- The built-in light is available to be replaced with the assembly tool. Refer to the Replacement of Light.

Sold Separately: Color filter (FL-□-VG)

Model	Appearance	Color	Model	Appearance	Color
FL-R-VG		Red	FL-B-VG		Blue
FL-G-VG		Green	FL-IC-VG		Infrared blocking

- The filter is available to be replaced with the assembly tool. Refer to the Replacement of Filter.

Sold Separately: Polarizing filter (FL-□-VG)

Model	Appearance	Color	Model	Appearance	Color
FL-P-VG		Window	FL-BP-VG		Blue
FL-RP-VG		Red	FL-ICP-VG		Infrared blocking
FL-GP-VG		Green			

- The filter is available to be replaced with the assembly tool. Refer to the Replacement of Filter.

Sold Separately: M12 Connector Cable

- For more information, refer to the M8/12 Connector Cable Product Manual.
- Tightening torque: 0.4 N m

Appearance	Power supply	Connector 1	Connector 2	Length	Feature	Model
	DC	M12 (Socket-Female) 8-pin	12-wire	2 m	• Drag chain type (2 million) • IP65 / IP67 • PUR	CID-2-VG
				5 m		CID-5-VG
				10 m		CID-10-VG
		M12 (Socket-Female) 8-pin, L type	12-wire	2 m		CLD-2-VG
				5 m		CLD-5-VG
				10 m		CLD-10-VG
		M12 (Socket-Female) 8-pin	12-wire	2 m	PVC	CID12-2
				5 m		CID12-5
				10 m		CID12-10
		M12 (Socket-Female) 8-pin, L type	12-wire	2 m		CLD12-2
				5 m		CLD12-5
				10 m		CLD12-10

Sold Separately: M12 Connector Communication Cable

- For more information, refer to the M12 Connector Communication Cable Product Manual.
- Tightening torque: 0.4 N m

Appearance	Power supply	Connector 1	Connector 2	Length	Feature	Model
	DC	M12 (Plug-Male) 8-pin	RJ45	2 m	• IP65 / IP67 • PUR	CIR-2-VG
				5 m		CIR-5-VG
				10 m		CIR-10-VG
		M12 (Plug-Male) 8-pin, L type	RJ45	2 m		CLR-2-VG
				5 m		CLR-5-VG
				10 m		CLR-10-VG
		M12 (Plug-Male) 8-pin	RJ45	2 m	• Drag chain type (16 million) • TPE	C1M8-2PR
				5 m		C1M8-5PR
				10 m		C1M8-10PR
		M12 (Plug-Male) 8-pin, L type	RJ45	2 m		C4M8-2PR
				5 m		C4M8-5PR
				10 m		C4M8-10PR
		M12 (Plug-Male) 8-pin	RJ45	2 m	PVC	C18-2PR
				5 m		C18-5PR
				10 m		C18-10PR
		M12 (Plug-Male) 8-pin, L type	RJ45	2 m		C48-2PR
				5 m		C48-5PR
				10 m		C48-10PR

Vision Master

For more information, refer to the Vision Master software manual.

■ Basic

- Device selecting and network setting
- Camera setting
- Input/Output setting
- Work group setting
- Inspection setting

■ Inspection function

The supported functions are varied by the image element of VG.

Function	Description
Alignment	To align position and orientation of the target based on the registered target
Brightness	To inspect average brightness of the target
Contrast	To inspect average contrast of the target
Area	To inspect area of the target
Shape comparison	To inspect shape of the target
Edge	To inspect the presence of the edge
Length	To inspect the length between two edges
Angle	To inspect the angle between two edges
Diameter	To inspect diameter of the circle
Object counting	To count the number of the object
Color identification	To inspect average color of the object
Area of color	To inspect area in a certain color
Object of color counting	To count the number of objects in a certain color

Troubleshooting

Please check routinely whether product is operating in normal status or not.
For more information, refer to the Vision Master software manual.

Symptom	Solution
When supplying power, POWER indicator is not turned on.	Check that status of power supplying and power cable connections is in normal.
	Check that power is being supplied within the rated range.
	Check that polarity of power is connected correctly.
	Check that power terminal is tightened thoroughly.
Product does not work due to the external input error.	Check that whether status of input COMMON or each of input wire connection is in normal.
	Check that the device connected to input has a problem.
Product does not work due to the external output error.	Check that output wire is connected correctly.
	Check that power to output is being supplied within the rated range.
	Check that the device connected to output has a problem.
	Check that specifications of load connected to output is within the rated range.
Error occurs in Ethernet communication.	Check that LINK LED is turned on. If not, check wiring.
	Check that communication (IP address, subnet mask, and gateway) is set correctly.
	Check that connection or specification of the communication cable is corresponding to that of Autonics guide. Use the Autonics cable (sold separately).